

Claims

1. An apparatus for exposing a photoresist-developed substrate, comprising:
a chamber, the chamber having at least one gas inlet, the gas inlet being adapted
to introduce a gas into the chamber;
a support within the chamber; and
a substrate on the support, the substrate having at least one developed photoresist
layer, the substrate being exposed to ultraviolet (UV) light within the chamber, the UV
light being generated from a UV generating agent, the exposure of the developed
photoresist of the substrate causing at least a portion of the developed photoresist layer to
transform to a hardened layer.
2. The apparatus as recited in claim 1, wherein the developed photoresist
layer is a silicon containing photoresist.
3. The apparatus as recited in claim 1, wherein the UV generating agent is
neon.
4. The apparatus as recited in claim 1, wherein the chamber is an etch
chamber.
5. The apparatus as recited in claim 1, wherein the hardened layer has a
thickness of between about 5% to about 75% of the thickness of the developed
photoresist layer.

6. The apparatus as recited in claim 2, wherein the hardened layer includes cross-linked polymer chains.

7. The apparatus as recited in claim 1, wherein a temperature inside the chamber is between about -30 C and about 70 C.

8. The apparatus as recited in claim 1, wherein argon gas is supplied to the chamber at a flow rate between about 1000 sccm and about 3000 sccm.

9. The apparatus as recited in claim 8, wherein neon gas is supplied to the chamber at a flow rate between about 0.2% and about 0.8% of the argon gas flow rate.

10. An apparatus for curing a photoresist on a substrate, comprising:
a chamber, the chamber having at least one gas inlet, the gas inlet being adapted to introduce an ultraviolet (UV) generating agent into the chamber;
a support within the chamber; and
a substrate on the support, the substrate having a first photoresist layer and a second photoresist layer, the first photoresist layer being disposed over the second photoresist layer, the first photoresist layer comprising silicon containing polymer chains, the silicon containing polymer chains cross-linking upon exposure to a UV light to form a hardened layer at a top region of the first photoresist layer, the UV light being generated by the UV generating agent.

11. The apparatus as recited in claim 10, wherein the UV generating agent is neon.

12. The apparatus as recited in claim 10, wherein the support is a chuck.

13. The apparatus as recited in claim 10, wherein a thickness of the second photoresist layer is about 6000 Å.

14. The apparatus as recited in claim 10, wherein an etch selectivity ratio of the first photoresist layer and the second photoresist layer is between about 8 and about 15.

15. The apparatus as recited in claim 10, wherein the polymer chains are cross-linked by one of silicon-hydrogen bonds and silicon-acetyl bonds.

16. A method for increasing a selectivity of a photoresist, comprising:
providing a substrate with a developed photoresist layer, the developed photoresist layer including polymer chains containing silicon;
exposing the substrate and the developed photoresist layer to an ultraviolet (UV) light, the UV light emanating from a UV generating agent;
converting a portion of the developed photoresist layer to a hardened layer, the hardened layer being created by cross-linking the polymer chains containing silicon, the cross-linking being activated by the UV light; and
performing an etch using the hardened layer.

17. The method as recited in claim 16, wherein the polymer chains are cross-linked through one of silicon-hydrogen bonds and silicon-acetyl bonds.

18. The method as recited in claim 16, wherein the providing a substrate with a developed photoresist layer further includes,
placing the substrate in an etch chamber.

19. The method as recited in claim 18, wherein the exposing the substrate further includes,

controlling the flow rate of an inert gas to the chamber between about 1000 sccm and about 3000 sccm.

20. The method as recited in claim 19, wherein the inert gas is argon.

21. The method as recited in claim 20, wherein the UV generating agent is neon.

22. The method as recited in claim 21, wherein the flow rate of the neon is between about 0.2% and about 0.8% of the flow rate of the argon.

23. The method as recited in claim 21, wherein the exposing the substrate further includes,

controlling the pressure of the chamber between about 50mT and about 300mT.

24. The method as recited in claim 17, wherein the portion of the developed photoresist layer converted to the hardened layer is between about 5% and about 75% of the developed photoresist layer.

25. A method for curing photoresist, comprising:
providing a substrate with a first photoresist layer and a second photoresist layer, the first photoresist being developed and disposed over the second photoresist layer, the first photoresist layer being formulated to include polymer chains containing silicon;

exposing the first photoresist layer to an ultraviolet (UV) light, the UV light emanating from a UV generating agent; and

converting a portion of the first photoresist layer to a hardened layer, the hardened layer being formed to increase an etching selectivity ratio.

26. The method for curing a photoresist as recited in claim 25, wherein the UV generating agent is neon.

27. The method for curing a photoresist as recited in claim 25, wherein exposing the first photoresist layer to a UV light further includes,
striking a plasma containing the UV generating agent to induce the generation of UV light.

28. The method for curing a photoresist as recited in claim 25, wherein the polymer chains are cross-linked through one of silicon-hydrogen bonds and silicon-acetyl bonds.

29. The method for curing a photoresist as recited in claim 25, wherein the curing occurs within an etch chamber.

30. In an etch chamber having a top and a bottom electrode, process gas inlets, and a chuck for holding a wafer, the wafer including a dielectric layer to be etched, a method for curing a photoresist disposed on the wafer, comprising:

introducing an ultraviolet (UV) generating agent into an etch chamber through a process gas inlet, the UV generating agent being induced to emit UV light;

exposing the wafer to the UV light, the wafer having a developed photoresist layer, the developed photoresist layer being formulated so as to include polymer chains containing silicon; and

converting a portion of the developed photoresist layer to a hardened layer upon exposure to the UV light.

31. The method for curing a photoresist as recited in claim 30, wherein the UV generating agent is neon.

32. The method for curing a photoresist as recited in claim 30, wherein converting a portion of the developed photoresist further includes,
cross-linking the polymer chains of the developed photoresist.

33. The method for curing a photoresist as recited in claim 30, further comprising:

controlling the gas flow rate, a temperature of the etch chamber, a pressure of the etch chamber, and a power supply to the top and the bottom electrode.

34. The method for curing a photoresist as recited in claim 30, wherein the portion of the photoresist layer converted to a hardened layer is between about 5% and about 75% of the photoresist layer.

35. The method for curing a photoresist as recited in claim 33, wherein the power to the top electrode is maintained at between about 100 watts and 1500 watts.

36. The method for curing a photoresist as recited in claim 33, wherein the power to the bottom electrode is maintained at between about 0 watts and 1000 watts.

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